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Attorney's Docket No.: 14083-002001

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Applicant : Roger Proksch, et al. Art Unit : 2862
Serial No.: 10/016,475 Examiner : Jay M. Patidar
Filed : November 30, 2001

Title : LINEAR VARIABLE DIFFERENTIAL TRANSFORMERS WITH IMPROVED MEASUREMENT CAPABILITIES (AS AMENDED)

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

A Transmittal letter and Appeal Brief dated **July 6, 2006** is attached.

Respectfully submitted,

Date: July 6, 2006

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Reg. No. 32,030

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BRIEF ON APPEAL

Applicants herewith file this brief on appeal, thereby perfecting the notice of appeal that was filed on March 6, 2006. The sections required by 37 CFR 41.37 follow:

(1) Real Party in Interest

The application is assigned to Asylum Research Corporation, who is hence the real party in interest.

(2) Related Appeals and Interferences

There are no known related appeals and/or interferences.

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CERTIFICATE OF TRANSMISSION BY FACSIMILE

I hereby certify that this correspondence is being transmitted by facsimile to the Patent and Trademark Office on the date indicated below.

July 6, 2006
Date of Transmission

Signature

S. Gebhart
Name of Person Signing Certificate

(3) Status of Claims

Claims 1-3 and 62-69 are pending in the case and are rejected. The claims 4-61 have been canceled during prosecution.

(4) Status of Amendments

An amendment after final was filed on February 6, 2006. An advisory action dated March 1, 2006 refused to enter this amendment.

(5) Summary of Claimed Subject Matter

Claim 1 defines a displacement transducer with first and second non-ferromagnetic coil forms having a common axis, and each having at least one winding. This is shown in figure 2, and explained on page 8 in the full paragraph bridging over to page 9. The diameter relationships of the forms are described page 8, third through fifth lines of the long paragraph.

The windings are magnetically coupled to one another and the coil forms are made of non-ferromagnetic material. See page 8, lines 5-8 of the major paragraph. The RMS noise represents less than 2.1 nm of movement between the coils. See page 13, second paragraph, the last line.

Claim 64 requires first and second non-ferromagnetic coil forms, formed of non-ferromagnetic material with a common axis,

see figure 2, page 8 and 9. The coils are one inside the other, see the paragraph bridging pages 8 and 9. The coils are magnetically coupled to one another. See the paragraph bridging pages 8-9.

Claim 67 further requires first and second non-ferromagnetic coil forms with a common axis, which are explained and shown figure 2, pages 8 and 9. The two coils one inside the other are also described in the paragraph bridging pages 8 and 9. The forms include "means for reducing Burkhausen noise". See, generally, page 11 of the specification, top paragraph.

Claim 69 requires forming first and second magnetic coil forms (see the paragraph bridging pages 8 and 9), allowing the coil forms to move relative to each other (again, see the paragraph bridging pages 8 and 9), reducing the effect of Burkhausen noise as they move (page 11, top paragraph) and generating an output signal responsive to relative displacements, where the output signal has an RMS noise with a positional accuracy of 2.1 nm or less. See page 13, second paragraph, last line.

(6) Grounds of Rejection

The ground of rejection to be reviewed on appeal is whether Claims 1-3 and 62-69 properly rejected as being unpatentable

over Neff in view of the admitted prior art and in view of common knowledge in the art.

(7) **Argument**

To reiterate the above, claims 1-3 and 62-69 are rejected under 35 USC 103(a) as allegedly being unpatentable over Neff in view of the alleged admitted prior art and in view of the alleged common knowledge in the art. This contention is respectfully traversed.

First, the admitted prior art simply admits that the prior art described attempted to reduce Barkhausen and electrical noise in conventional LVDT's. It was never said that non-ferromagnetic or magnetic coil forms were well-known in the art. In fact, this statement is strongly disagreed with. Applicants have previously requested a reference in support of this feature to the extent that it was based on personal knowledge of the Examiner. No such reference has been provided. The office action states that it is "very common in the magnetic field to have a coil form made from non-ferromagnetic material e.g. plastic bobbin". However, this is entirely based on speculation. The question is whether it is obvious to modify a displacement transducer of the claimed type to use a non-ferromagnetic material. No reference has been cited, and no proper showing of this has been made. Accordingly, on its face,

the rejection does not meet the patent office's burden of providing a prima facie showing of unpatentability. Turning more specifically to the actual rejection, Claim 1 defines a displacement transducer where the coil forms can be displaced relative to each other, where at least one winding on the magnetic movable coil form is magnetically coupled to the other, and has electronic circuitry "generating a signal responsive to relative displacements between the coil forms in the range of microns or less and having an RMS noise representing less than 2.1 nm of movement between the coils". Note the specific language of Claim 1 requires that there are first and second "non-ferromagnetic coil forms". Since there are forms, there must be material that actually make the forms. Accordingly, a so-called air core, is not a form, in fact, it is a lack of a form.

With all due respect, Neff is much less sensitive than the displacement sensor that is claimed and the numerical range of Claim 1. Neff describes a number of configurations of the LVDT primary and LVDT secondary coils. One of those coils has the primary wound on an air core. Neff refers to the electronics that are required to complete a functioning LVDT using the following language:

> "Also in each modification [of the LVDT coils] the wiring diagram including leads from the coils to a

circuit including a vacuum tube oscillator and electronic volt meter circuit are similar to each other and generally similar to that shown in the US patent to Joseph J. Neff for electrical caliper, number 2, 364, 237 dated December 5, 1944".

See column 2 of the Neff patent, lines 23-29.

Hence, the sensitivity of the electronics must be that as considered in the earlier US patent 2,364,237. Neff '237 characterizes the sensitivity by stating "the voltmeter is so designed that its sensitivity may be adjusted depending on the precision desired in the measurement of work. The pickup mechanism is capable of accurate measurements in the orders of tenths of thousands of an inch" Neff '237, column 2, lines 10-15.

1/10,000th of an inch is 2.54 μ. Claim 1 defines an apparatus that has "electronic circuitry generating a signal responsive to relative displacements between the coil forms in the range of microns or less". Hence, the apparatus is more sensitive than that described in Neff.

In addition, Claim 1 defines that the RMS noise represents less than 2.1 nm of movement between the coils. Since the accurate measurements are on the order of tenths of thousandths of an inch, this is clearly orders of magnitude greater than the claimed "2.1 nm of movement".

Finally, while the admitted prior art does describe the advantages of removing Barkhausen noise, it also describes that the known schemes for removing that noise are ineffective: increasing the primary drive current, and others described in the specification on page 5. The specification also describes that some LVDT designs have eliminated that noise without understanding that they were doing, by "substituting an air core for the ferromagnetic core of the conventional LVDT". Clearly substituting the air core, as may have been done in Neff, does not make it obvious to do this in order to form "an RMS noise representing less than 2.1 nm of movement between the coils".

Therefore, Claim 1 should be allowable for these reasons.

Claim 62 defines that the first and second coil forms collectively form "means for reducing Barkhausen noise...". According to the patent office's examination regulations, this claim can only be found obvious if the prior art "performs the function specified in the claims" (MPEP 2183). Therefore, a proper rejection of this claim must show that the reference actually reduces the Barkhausen noise. Nothing in the cited prior art teaches or suggests this feature.

The remaining claims should be allowable for similar reasons. Claim 64 requires the coil forms made of non-ferromagnetic material. Neff teaches an air core. An air core

is not a core made of "non-ferromagnetic material coil form". In fact, the air core is not a coil form at all. Therefore, this does not render obvious Claim 64. Claims 65 and 66 should be allowable for analogous reasons. Claim 67 defines that the coil forms are "means for reducing Barkhausen noise". This is further patentable over the cited prior art which teaches nothing about using this specific structure to reduce the Barkhausen noise.

Finally, Claim 69 defines a method of operating a transducer which includes "reducing an effect of Barkhausen noise on the coil forms as they move". Nothing in the cited prior art teaches or suggests this feature. The admitted prior art in fact teaches that the techniques disclosed therein do not actually do that.

Accordingly, and with all due respect, the rejection set forth has quite clearly failed to meet the patent office's burden of providing a prima facie showing of unpatentability. With all due respect, therefore, reversal of the legally incorrect position taken by the patent office is respectfully requested.

Attorney's Docket No.: 14083-002001

Please apply the brief fee of $250, the 2 month extension of time fee in the amount of $225, and any other applicable charges or credits, to Deposit Account No. 06-1050.

Respectfully submitted,

Date: July 6, 2006

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Appendix of Claims

1. A displacement transducer comprising: first and second non-ferromagnetic coil forms with a common axis, each of said first and second coil forms wound with at least one winding;

an outside diameter of the first form and said at least one winding being smaller than an inside diameter of the second form so that said first and second forms may be displaced relative to each other with the first form inside the second form, one of the coil forms being movable and the other coil form being stationary;

the at least one winding on the movable form magnetically coupled to the at least one winding on the stationary form in the absence of any ferromagnetic element inductively coupling the windings; and

electronic circuitry generating a signal responsive to relative displacements between the coil forms in the range of microns or less and having an RMS noise representing less than 2.1 nm of movement between the coils.

2. The transducer of claim 1, in which the sensor comprises;

the coil form with the smaller outside diameter wound with two or more windings and the other coil form wound with a single winding.

3. The transducer of claim 1, in which the sensor comprises;

the coil form with the larger inside diameter wound with two or more windings and the other coil form wound with a single winding.

62. A transducer as in claim 1, wherein said first coil form and said second core form collectively are means for reducing Barkhausen noise in the displacement transducer.

63. A transducer as in claim 1, wherein said electronic circuitry generates a signal having an RMS noise which produces a positional inaccuracy of less than 1.9 nm.

64. A displacement transducer comprising:

first and second non-ferromagnetic coil forms made of non-ferromagnetic material with a common axis, each of said first and second coil forms wound with at least one winding;

an outside diameter of the first coil form and said at least one winding being smaller than an inside diameter of the second coil form so that said first and second coil forms may be displaced relative to each other with the first coil form inside the second coil form, and with one of the coil forms being movable and the other coil form being stationary;

the at least one winding on the movable form magnetically coupled to the at least one winding on the stationary form in the absence of any ferromagnetic element inductively coupling the windings; and

electronic circuitry generating a signal responsive to relative displacements between the coil forms in the range of microns or less.

65. A transducer as in claim 64, wherein said electronic circuitry generates a said signal having an RMS noise which produces a positional inaccuracy of less than 2.1 nm.

66. A transducer as in claim 64, wherein said coil forms and said core forms collectively means for reducing Barkhausen noise in the displacement transducer.

67. A displacement transducer comprising:

first and second non-ferromagnetic coil forms with a common axis, each of said first and second coil forms wound with at least one winding;

an outside diameter of the first coil form and its at least one winding being smaller than an inside diameter of the second coil form so that said first and second coil forms may be displaced relative to each other with the first coil form inside the second coil form, and with one of the coil forms being movable and the other coil form being stationary;

said first coil forms and said second coil core forms including means for reducing Barkhausen noise when the

first and second coil forms move relative to each other; and

electronic circuitry generating a signal responsive to relative displacements between the coil forms in the range of microns or less and having reduced Barkhausen noise effect.

68. A transducer as in claim 67, wherein said electronic circuitry generates a said signal having an RMS noise which produces a positional inaccuracy of less than 2.1 nm.

69. A method of operating a displacement transducer, comprising:

forming first and second non-ferromagnetic coil forms which each have at least one winding, and are wound with a common axis, with one of coil forms being inside the other;

allowing one of said coil forms to move relative to the other;

reducing an effect of Barkhausen noise on the coil forms as they move; and

generating an output signal responsive to relative displacements between the coil forms, which output signal

has an RMS noise that forms a positional inaccuracy of 2.1 nm or less.

Attorney's Docket No.: 14083-002001

Evidence Appendix

None.

Attorney's Docket No.: 14083-002001

Related Proceedings Appendix

None.